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Presynaptiphilus paraminutus n. sp. (Copepoda: Poecilostomatoida: Synaptiphilidae) Associated with the Ophiuroid *Amphioplus ancistrotus* (Echinodermata: Ophiuroidea) in the Yellow Sea

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ABSTRACT

Presynaptiphilus paraminutus is described as a new species in association with the ophiuroid *Ampioplus ancistrotus* (H. L. Clark) collected from an intertidal sand beach in the Yellow Sea. The new species is closely related to *P. minutus* in having the identical leg structure, but may be differentiated from the latter by the larger body, the longer genital double-somite and caudal rami, and the shorter pre-anal somite.

Key words: *Presynaptiphilus paraminutus*, n. sp., Copepoda, association, Ophiuroida

INTRODUCTION

Copepods of the genus *Presynaptiphilus* Bocquet and Stock, 1960 are among the primitive poecilostomatoid copepods and all have been found as associates of the burrowing ophiuroids. The genus is consisted of three known speices: *P. acrocnidae* recorded by Bocquet and Stock (1960) from *Acrocnida brachiata* (Montagu) on the Atlantic coast of France, *P. amphiopli* recorded by Humes and Hendler (1972) from *Amphioplus abditus* (Verrill) on the American coast of North Atlantic, *P. minutus* recorded by Kim (2000) from *Amphiura sinicola* (Matsumoto) on the Korean

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coast of the Yellow Sea.

In this paper we describe the fourth species discovered on the coast of the Yellow Sea. The specimens were recovered from washings of the burrowing ophiuroid *Amphioplus ancistrotus* (H. L. Clark) dug out from sands of low tidal area. The dissection and observation of the specimens were made in lactic acid, using reversed slide method (Humes and Gooding, 1964). In the following description, the body lengths were measured from the apex of the cephalothorax to the posterior margin of the caudal rami of a selected large specimen, excluding caudal setae. In the formula of the armature of legs, Roman numerals indicate spines and Arabic numerals represent setae.

Family Synaptiphilidae Bocquet, 1953 펄속극피노벌레과(신칭)

***Presynaptiphilus paraminutus* n. sp. 거미불가사리노벌레(신칭) (Figs. 1-3)**

Material examined. Thirty ♀♀ and 10♂♂ from washings of the ophiuroid *Amphioplus ancistrotus* (H. L. Clark), collected from the intertidal mud flat at Kosapo Beach in Puan (35° 39′N, 126° 21′E), Yellow Sea, on 26 September 1999. Holotype (♀), allotype (♂), and 25 paratypes (20 ♀♀, 5 ♂♂) will be deposited in the U. S. National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2♀♀ and 1♂) and other specimens are retained in the collection of the junior author.

Female. Body (Fig. 1A) small, moderately elongate, 650 μm long. Greatest width 272 μm. Prosome comprising cephalothorax, and second and third pedigerous somites. Posterior corners of cephalothorax and succeeding two prosomites rounded. Third pedigerous somite (second metasome) narrower but distinctly longer than second pedigerous somite.

Urosome almost cylindrical, comprising fourth and fifth pedigerous somites, genital double-somite and three-segmented abdomen (Fig. 1B). Fourth pedigerous somite very narrow, without epimera, only slightly wider than fifth pedigerous somite. Genital double-somite 70×83 μm, weakly tapering. Genital area located dorsolaterally at about anterior fourth. Genital double-somite and first 2 abdominal somites armed with acute spinules at posterolateral corners. Three abdominal somites 41×55, 50×50, and 13×37 μm, respectively. Second abdominal somite clearly longer than other 2 abdominal somites. Third abdominal somite (= anal somite) characteristically short, ornamented with 1 pair of spinules at each side near base of caudal ramus. Caudal ramus 27×16 μm (ratio 1.69 : 1), with 7 setae. Outer proximal seta minute. Outer one of two mid-terminal setae shortest among seven setae, spiniform, whereas inner one longest, more than four times as long as next longest, outermost terminal seta. All six setae naked.

Rostrum broader than long, with posterior margin widely rounded (Fig. 1D). Antennule (Fig. 1E) six-segmented, tapering, with armature formula 4, 14, 9, 4, 2+1 aesthetasc, and 7+1 aesthetasc. Antenna (Fig. 1F) four-segmented, with armature formula 1, 1, 3+1 claw, and 7. First segment longest among segments, with 5 patches of setules in addition to inner terminal seta. Third segment very short; claw strong; innermost one of three setae very tiny. Fourth segment distinctly shorter than wide, distally wider; two inner ones of seven setae specialized, with expanded and pectinated tip; two smaller setae plumose, other setae naked.

Labrum (Fig. 1G) rhomboid, with posterior margin strongly tapering and truncate at posteromedian apex. Mandible (Fig. 1H) armed with one terminal, distally bifurcate, spiniform element and one subterminal plumose seta. Paragnath (Fig. 2A) being unornamented, distally

tapering lobe. Maxillule (Fig. 2B) bilobed, armed with three plumose setae on larger lobe and one smaller naked seta on smaller lobe. Maxilla (Fig. 2C) two-segmented; first segment with one dorso-distal, proximally thick, spiniform setae; distal segment slender, terminated in spiniform element, with one minute seta on ventral margin and two distal setae. Maxilliped (Fig. 2D) two-segmented. First segment prolonged, divided into 2 parts by articulation in middle; proximal part with row of small spinules on proximal portion of anterior margin; distal part comb-like, with spinules along anterior margin. Second segment originated from basal part of first segment, pouch-like, 42×39 μm, with 2 pairs of small setae distally, and row of setules and row of minute spinules on dorsal surface.

Leg 1 (Fig. 2E), leg 2 (Fig. 2F) and leg 3 with three-segmented rami, but leg 4 (Fig. 2G) with two-segmented rami. Posterior margin of intercoxal plates of legs 1-3 armed with acute spinules. These spinules also occurring on posterior margin of basis of legs 1-3 and outer margins of nearly all exopodal and endopodal segments of legs 1-4. Distal segment of endopod of leg 1 prolonged as tapering process; outer spine of this segment located near middle of outer margin of segment. Inner coxal seta of leg 1 spine-like. Spines on rami of leg 4 seta-like. Spine and setal formula of legs 1-4 as follows:

Leg 1	coxa 0-1;	basis 1-I;	exp. I-0; I-1; III, I, 4;	enp. 0-1; 0-0; I, 3
Leg 2	coxa 0-1;	basis 1-0;	exp. I-0; I-1; III, I, 5;	enp. 0-1; 0-2; III, 3
Leg 3	coxa 0-0;	basis 1-0;	exp. I-0; 0-1; III, I, 5;	enp. 0-1; 0-1; III, 3
Leg 4	coxa 0-0;	basis 1-0;	exp. I-0; I, II, 5;	enp. 0-0; I, III

Leg 5 two-segmented (Fig. 1B). Basal segment well marked from fifth pedigerous somite, with one long seta and spinules on outer side. Distal free segment 42×21 μm (ratio 2.0:1), armed with 4 setae (one on outer margin, 1 subterminal, and 2 terminal), all of these setae longer than free segment, and ornamented with spinules near base of setae. Leg 6 represented by 1 minute spinules in genital area (Fig. 1B).

Male. Body (Figure 3A) resembling that of female, gradually narrowed posteriorly. Length 602 μm. Maximum width 278 μm. Prosome three-segmented, and urosome seven-segmented. Genital somite short (Fig. 3B), 29×82 μm (ratio 1 : 2.8). Four abdominal somites 46×80, 39×61, 44×52, and 9×34 μm, respectively. Caudal ramus 24×14 μm (ratio 1.71 : 1).

Antennule with 1 additional setae on third segment (therefore 10). Antenna as in female. Mouthparts as in female, except for maxilliped. Maxilliped (Fig. 3C) consisting of three segments and terminal claw. First segment unarmed. Second segment greatly expanded proximally and strongly tapering; inner proximal region with two setae and 1 hole where tip of terminal claw inserts; inner margin with one row of spinules, two of proximal spinules distinctly enlarged. Third segment small and unarmed. Claw long, curved distally, and proximally with two small setae.

Leg 1 with more prominent terminal process on distal segmemt of endopod, otherwise as in female. Legs 2-4 as in female. Basal segment of leg 5 well marked from fifth pedigerous somite as in female. Leg 6 not seen.

Etymology. The specific name *paraminutus* (a combination of *par*, meaning "similar to" in Latin, and *minutus*) refers to the close relation of the new species to the previously recorded *P. minutus*.

Remarks. In having one spine and three setae (formula I, 3) on the distal segment of leg 1 endopod, *P. paraminutus* n. sp. is closely related to *P. minutus* and differ from the two Atlantic

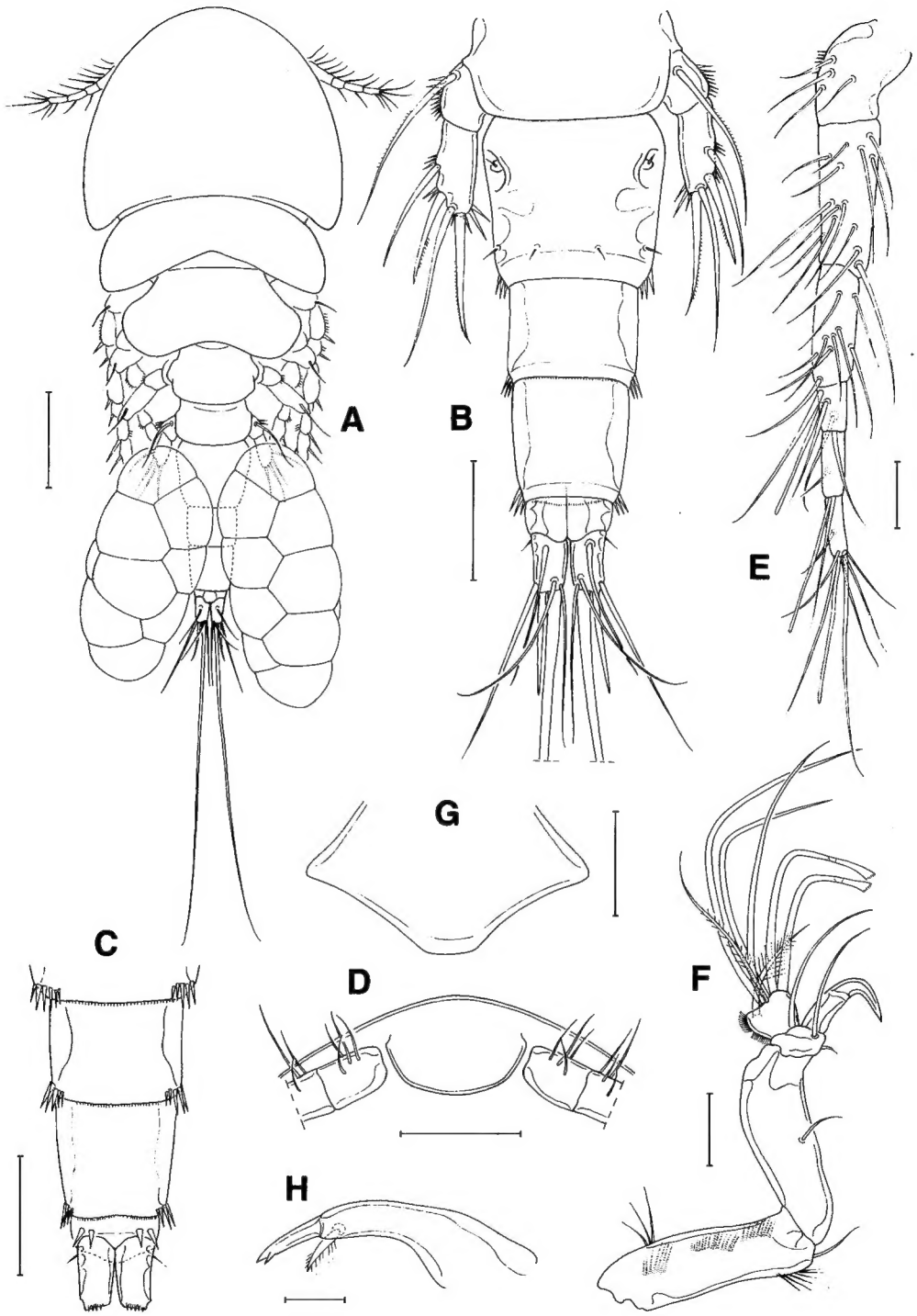

Fig. 1. *Presynaptiphilus paraminutus* n. sp., female. A, habitus, dorsal; B, posterior part of body, dorsal; C, abdomen, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, labrum; H, mandible. Scales: A, 0.1 mm: B-D. 0.05 mm: E-G. 0.02 mm: H. 0.01 mm.

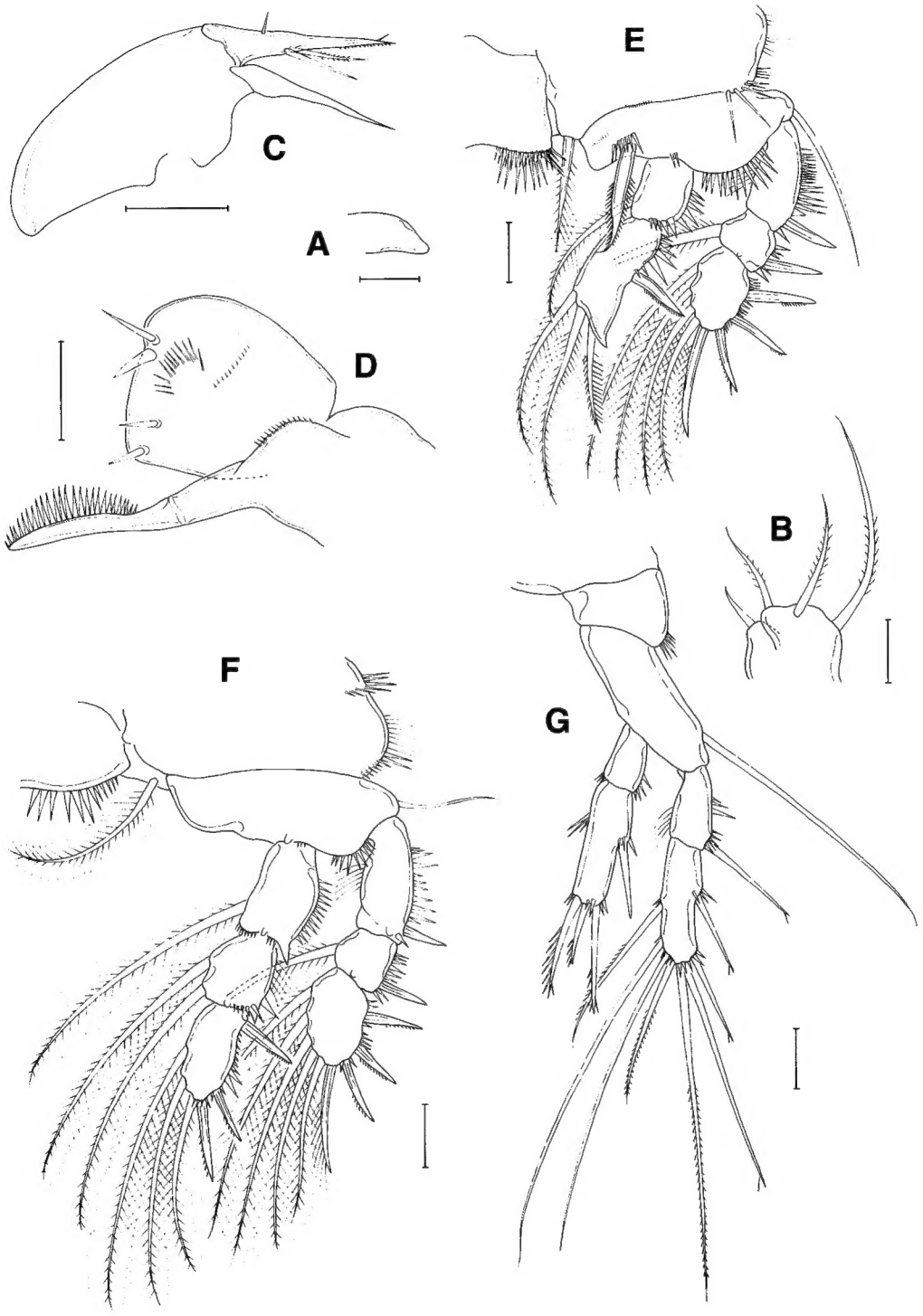

Fig. 2. *Presynaptiphilus paraminutus* n. sp., female. A, paragnath; B, maxillule; C, maxilla; D, maxilliped; E, leg 1; F, leg 2; G, leg. 4. Scales: A, B, 0.01 mm; C-G, 0.02 mm.

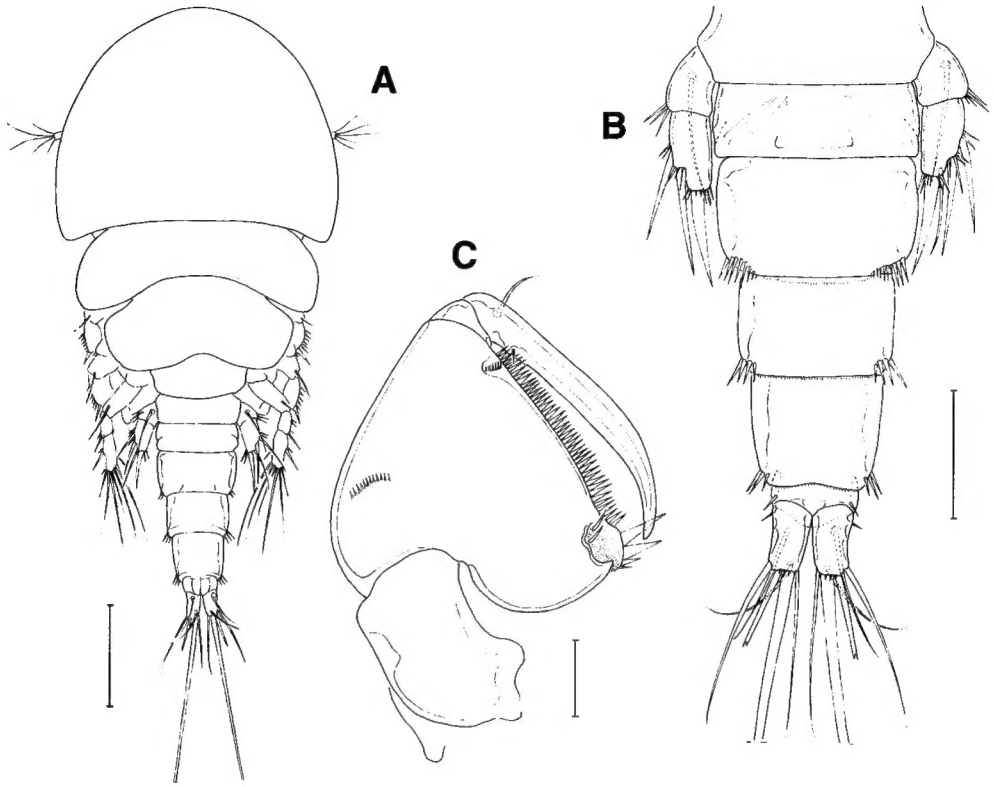

Fig. 3. *Presynaptiphilus paraminutus* n. sp., male. A, habitus, dorsal; B, posterior part of body, dorsal; C, maxilliped. Scales: A, 0.1 mm; B, 0.05 mm; C, 0.02 mm.

species, both of the latters armed with one spine and five setae (formula I, 5). The structures of other legs and morphologies of other body parts are also alike between *P. paraminutus* and *P. minutus*. *P. paraminutus* may be differentiated from *P. minutus* by the following ways: 1) The body of *P. paraminutus* is larger (0.65 mm long in female and 0.60 mm in male) than that of *P. minutus* (0.59 mm long in female and 0.57 mm in male); 2) The caudal ramus of *P. paraminutus* is longer (ratio of length to width 1.69 : 1) than that of *P. minutus* (ratio 1.27 : 1); 3) the genital double-somite of *P. paraminutus* is distinctly longer than that of *P. minutus* (70 × 83 μm, compared to 49 × 75 μm); 4) the pre-anal somite is as long as wide (in female) or shorter than wide (in male), unlike that of *P. minutus* in which it is longer than wide in both sexes; and 5) the distal segment of leg 5 of *P. paraminutus* is longer (42 μm long in female) than that of *P. minutus* (29 μm long).

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REFERENCES

Bocquet, C. and J. H. Stock, 1960. Copépodes parasites d'invertébrés des côtes de France. XII. Étude de *Presynaptiphilus acrocnidae* nov. gen., nov. sp., copépode parasite de l'ophiuride *Acrocnida brachiata* (Montagu). Proc. K. ned. Akad. Wet., C, **63**(2): 220-229.

Humes, A. G. and R. U. Gooding, 1964. A method for studing the external anatomy of copepods. Crustaceana, **6**: 238-240.

Humes, A. G. and G. Hendler, 1972. New cyclopoid copepods associated with the ophiuroid genus *Amphioplus* on the eastern coast of the United States. Trans. Amer. Micros. Soc., **91**(4): 539-555.

Kim, I. -H., 2000. Poecilostomatoid copepods from an intertidal mud flats in the Yellow Sea. J. Nat. Hist., **34**: 367-432.

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서해의 거미불가사리 *Amphioplus ancistrotus*에 공생하는 요각류 1신종 *Presynaptiphilus paraminutus*

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요 약

서해안의 조간대에서 거미불가사리류 *Amphioplus ancistrotus*에 공생하는 요각류 1신종 *Presynaptiphilus paraminutus*를 기재하였다. 이 신종은 다리의 구조를 볼 때 전에 기록된 *P. minutus*와 매우 유사하지만 몸이 더 크고, 생식이 중절과 꼬리가지가 더 긴 반면, 항문전절은 더 짧아서 후자의 종과 구별된다.